

# ETAS MHD2.0

Interface for Measurement/Replay  
of Video Raw Signals



User Guide

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# 1 Safety Information

This chapter contains information about the following topics:

- Intended Use ..... 6
- Classification of Safety Messages ..... 6
- Safety Information ..... 7

Refer to the following safety instructions and the technical documentation available to download from the ETAS website [www.etas.com](http://www.etas.com). Keep the information provided in a safe place.

Failure to comply with the safety instructions may lead to the risk of damage to life and limb or property. The ETAS Group and its representatives shall not be liable for any damage or injury caused by improper operation or use of the product.

Only use the product if you have read and understood the information concerning safe operation and have the required qualifications and training for this product. If you have questions about safe operation, contact ETAS:

- Technical Support: [www.etas.com/hotlines](http://www.etas.com/hotlines)
- ETAS contact partners by region: [www.etas.com/contact](http://www.etas.com/contact)

The product is only approved for the applications described in the technical documentation. When using and operating this product, all applicable regulations and laws must be observed.

ETAS products made available as beta versions or prototypes of firmware, hardware and/or software are to be used exclusively for testing and evaluation purposes. These products may not have sufficient technical documentation and not fulfill all requirements regarding quality and accuracy for market-released series products. The product performance may therefore differ from the product description. Only use the product under controlled testing and evaluation conditions. Do not use data and results from beta versions without prior and separate verification and validation and do not share them with third parties.

Before starting up the product, check whether there is a Known Issue Report (KIR) for that product version: [www.etas.com/kir](http://www.etas.com/kir) (password: KETASIR). Note the information given in the report.

Program codes or program control sequences that are created or changed via ETAS products, as well as all types of data obtained through the use of ETAS products, must be checked for their reliability and suitability prior to use or distribution. Only use these codes or sequences in public areas (e.g., in road traffic) if you have ensured that the application and product settings are safe through testing in self-contained and designated testing environments and circuits.

This ETAS product allows you to influence safety-relevant systems or data (e.g. in motor vehicles, vehicle components and test benches). In the event of a malfunction or a hazardous situation, it must be possible to put the system into a safe state (e.g., emergency stop or emergency operation).

## 1.1 Intended Use

The product was developed and approved for applications in the automotive sector. Only operate the product as per its specifications. If the product is used in any other way, product safety is no longer ensured.

The product is designed to transfer video data from image-capturing sources to ADCUs and measuring systems and data loggers.

### Application areas

- The product is approved for use in the following areas:
  - Interior
  - Passenger cell
  - Trunk
  - Laboratory
  - Test bench
- Do not operate the product in a wet or damp environment.
- Do not operate the product in potentially explosive atmospheres.

### Technical Condition

The product is designed in accordance with state-of-the-art technology. Only operate the product and its accessories if they are in perfect working order. Shut down a damaged product immediately. Do not open or alter the product. Only ETAS may make changes to the product.

## 1.2 Classification of Safety Messages

The safety messages used here warn of dangers that can lead to personal injury or damage to property:



**DANGER** \_\_\_\_\_

indicates a hazardous situation with a high risk of death or serious injury if not avoided



**WARNING** \_\_\_\_\_

indicates a hazardous situation of medium risk which could result in death or serious injury if not avoided.



**CAUTION** \_\_\_\_\_

indicates a hazardous situation of low risk which may result in minor or moderate injury if not avoided.

**NOTICE** \_\_\_\_\_

indicates a situation which may result in damage to property if not avoided.

## 1.3 Safety Information

### 1.3.1 Assembly

Only install, connect, disconnect, and cable ETAS products and components when they are de-energized.

### Installation Location

Install the product on a smooth, level and firm surface.



#### **WARNING**

The following products are a Class A piece of equipment:

- MHD2.0B-8M, MHD2.0B-8R

This piece of equipment may cause radio interference in living areas.

In this case, the user may be required to take appropriate measures.

#### **NOTICE**

**Damage to the electronics due to potential equalization**

The cables' shield may be connected to the housing, the ground or the ground for the product's power supply. If there are different ground potentials in the test setup, equalizing currents can flow between the products via the cables' shield.

Take account of different electric potentials in your test setup and take appropriate measures to prevent equalizing currents.

### Securing the Product

The housing must not be damaged while securing the product.

Only secure the product to fastening elements intended for this.



#### **WARNING**

**Risk of injury due to inadequate fastening**

Secure the product so that it does not move uncontrollably.

Only use carrier systems and fastening materials that can accommodate the static and dynamic forces of the product and are suitable for the ambient conditions.

### Ventilation

- Protect the product against direct solar radiation and other sources of heat.
- Ensure that there is sufficient air circulation for efficient heat exchange.
  - Keep an area of at least 5 cm clear to the rear and at least 9.5 cm to the front.
  - Do not cover the ventilation slots.
  - Do not operate the product in enclosed areas.

### 1.3.2 Operation

Only operate the product with the latest firmware. You can find information about updating the firmware in the user manual.

If the firmware update is not completed successfully, try it again. If a new firmware update is not possible and the product is not functional, send the product to ETAS.

### 1.3.3 Electrical Connection

#### Electrical Safety and Power Supply

- Only connect the product to electric circuits with safety extra-low voltage in accordance with IEC 61140 (devices of class III) within the voltage limits for accessible parts as per IEC 61010-1.
- Comply with the connection and setting values (see chapter "Technical Data" on page 31).
- The power supply for the product must be safely disconnected from the mains power. For example, use a car battery or a suitable lab power supply.
- Only use lab power supplies with dual protection for the supply network (with double/reinforced insulation (DI/RI)).
- The power supply must be suitable for use according to the ambient conditions for the product.
- It is possible to discharge the vehicle battery in regular operation and long standby operation.
- Central load-dump protection is required for operation.

#### Connection to the Power Supply



#### WARNING

##### Risk to life from electric shock

If an unsuitable power supply is used, this may generate a hazardous electrical voltage.

- Use a power supply that is permitted for the product.
- Do not connect the product to power outlets.
- To prevent inadvertent connection to power outlets, use power cords with safety banana plugs in areas with power outlets.

- Only connect the product to the power supply via a suitable fuse protection.
- Ensure that the connections of the power supply are easily accessible.

#### De-energizing the product

1. Disconnect the product from the power supply in one of the following ways:
  - Switch off the laboratory power supply for the test setup.
  - Disconnect the test setup's connection to the vehicle battery.
  - Remove the power cord.
2. Remove all cables from the product.



## 1.3.4 Cables and Accessories

### Cables

- Only use ETAS cables, cables recommended by ETAS or other cables certified for the application.
- Route the cables such that they are protected against abrasion, damage, deformation and kinking.
- Do not place any objects on the cables.
- Do not use any damaged cables.
- The connector and connection must not be dirty.
- The connector and connection must be compatible.
- Correctly align the connector with the connection.
- Do not connect the connector and connection by force.

#### ***NOTICE***

##### **Damage to the electronics**

Incorrectly connected cables and devices may damage the product's electronics.

Connect only the appropriate cables and devices to the inputs and outputs.

For detailed information about cables, see "Cables and Accessories" on page 39.

### Accessories

Use ETAS accessories, accessories recommended by ETAS or other accessories certified for the application. For detailed information about accessories, see the product's user manual.

## 1.3.5 Transport

- Only transport the product individually.
- Remove all connected cables before transportation.
- Do not transport the product by the connected cables.

## 1.3.6 Maintenance

The product is maintenance-free.

### Cleaning

- Only clean the product when it is de-energized.
- Do not use compressed air to clean the fans.
- Do not use cleaning agents that could harm the product.
- Do not apply cleaning agents directly onto the product.
- Use a dry or slightly dampened, soft, lint-free cloth.
- Make sure that no moisture enters the product.

**1.3.7 Repairs**

If repairs are required, send the product to ETAS.

**1.3.8 Shipment and Packaging**

You can find the return form and information about this process on the ETAS website: [www.etas.com/hw\\_return\\_form](http://www.etas.com/hw_return_form)

## 2 Introduction

### 2.1 Description

There are two versions of the MHD2.0:

MHD2.0 Measurement



**Fig. 2-1** Picture of the MHD2.0 Measurement

MHD2.0 Replay



**Fig. 2-2** Picture of the MHD2.0 Replay

The MHD2.0 is a Measurement Interface for Microprocessors and Microcontrollers for capturing Video raw signals. The name MHD2.0 consists of the possible application scenarios:

- **M**easurement
- **H**IL Replay
- **D**ebug

The video data of the cameras are forwarded to the Advanced Driving Control Unit (ADCU). In addition, the data is converted and optionally compressed, with or without loss, and then forwarded to the measurement computer. Compatibility with the specific camera chipset can be established via extensions of the modular MHD2.0 system.

## 2.2

### Functions

Following block diagram gives an overview about the internal functions of the MHD2.0 Measurement.

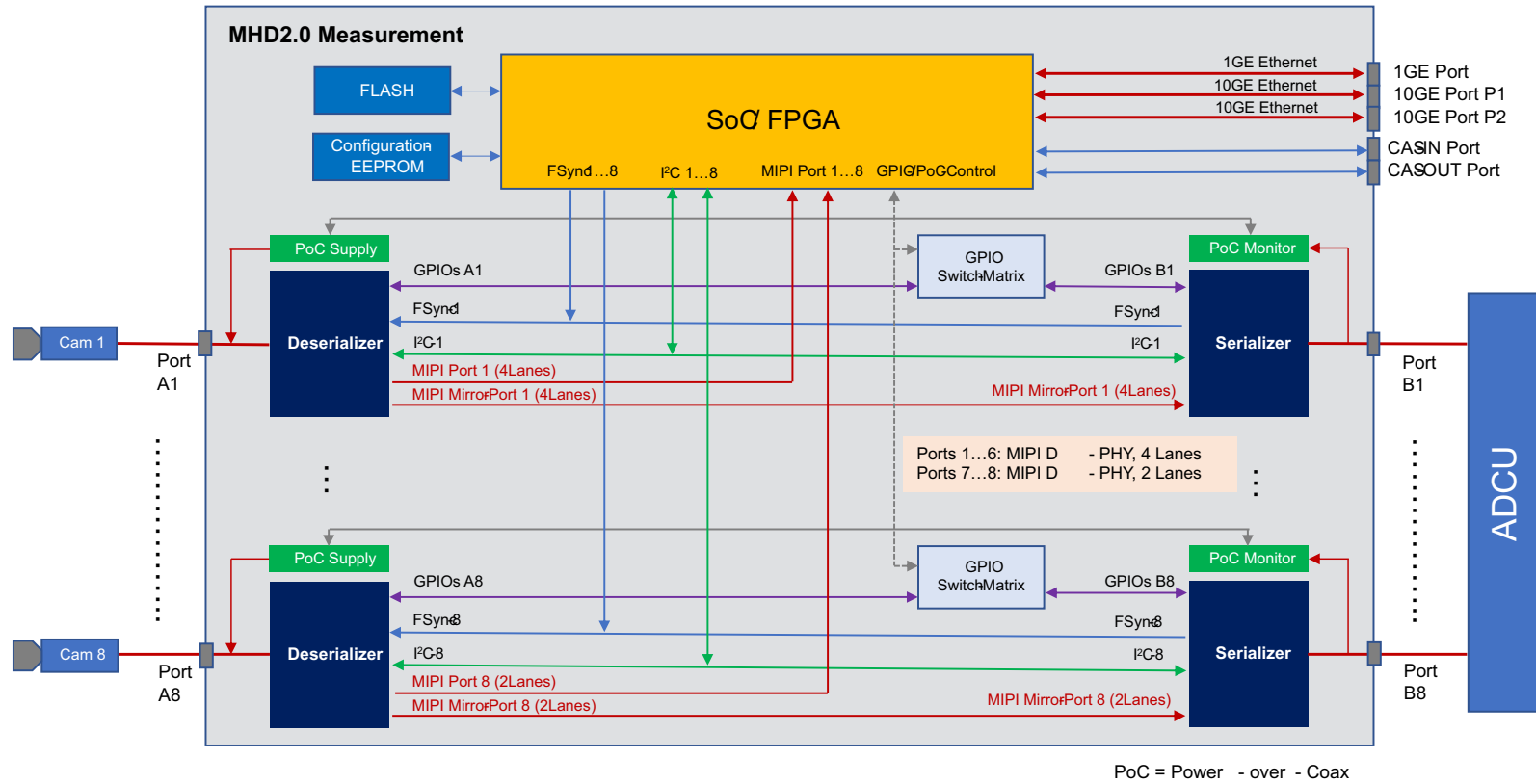


Fig. 2-3 Block diagram MHD2.0 Measurement internal functions

Following block diagram gives an overview about the internal functions of the MHD2.0 Replay.

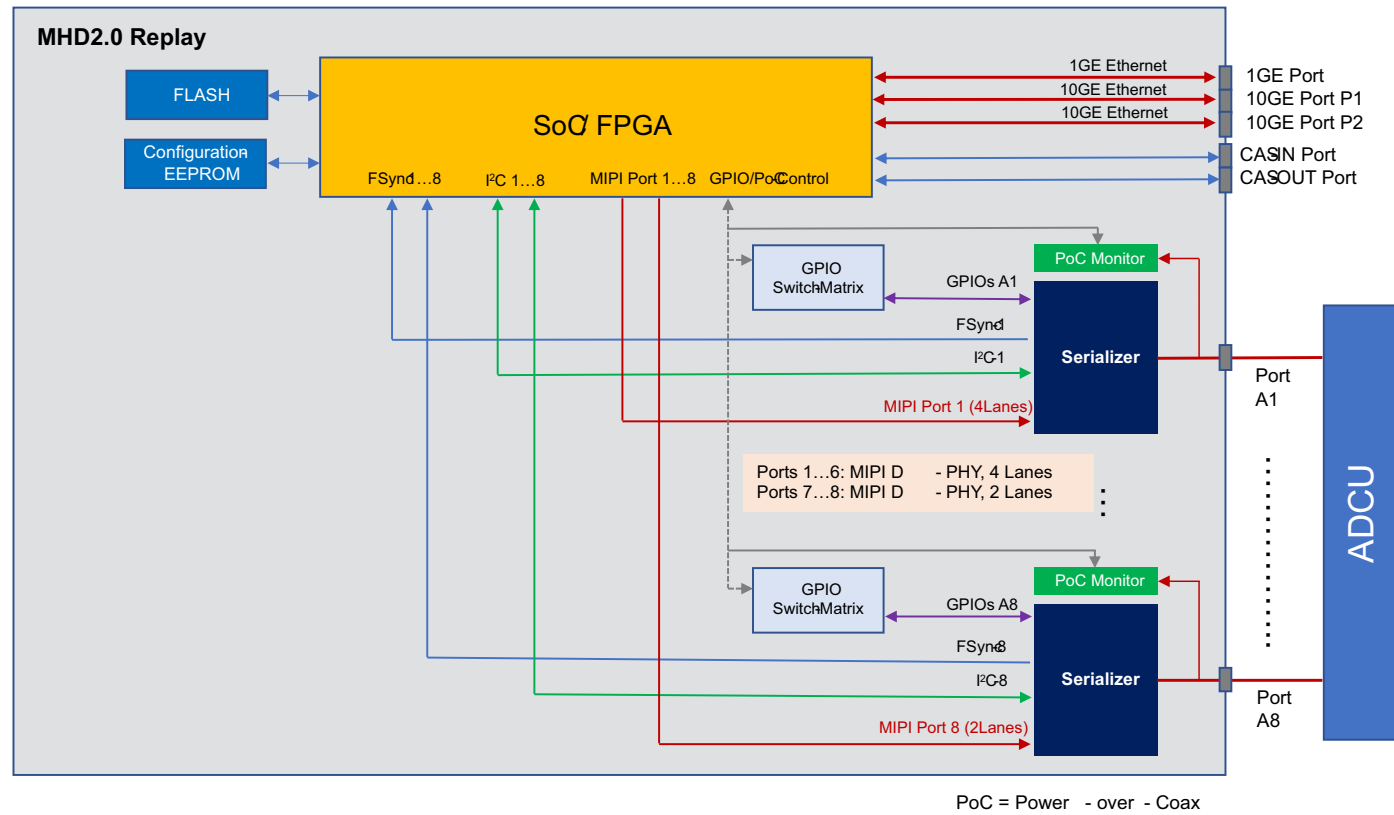


Fig. 2-4 Block diagram MHD2.0 Replay internal functions

### 2.2.1 Measurement

During measurement, video data of the cameras are recorded by the MHD2.0 and passed on to a measurement computer. In addition, it is possible to connect and forward the video data to an ADCU.

#### Measuring with ADCU

If an ADCU is connected during measurement, the video data of the cameras are sent to the measurement computer and to the ADCU. The video data is processed in the ADCU and added with further information.

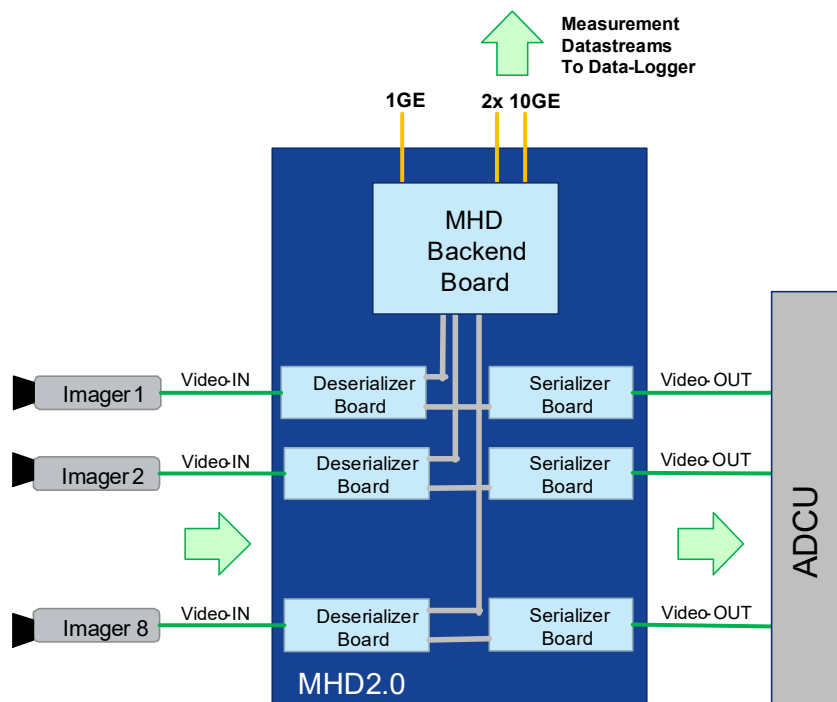


Fig. 2-5 Measurement Mode with ADCU

### Measuring without ADCU

When measuring without ADCU, the video data of the cameras are only passed on to a measuring computer. Since the cameras are not controlled by an ADCU, additional exposure control by the MHD2.0 system or the measurement computer may be useful depending on the ambient conditions.

The measurement mode is supported by MHD2.0 "-8M" devices.

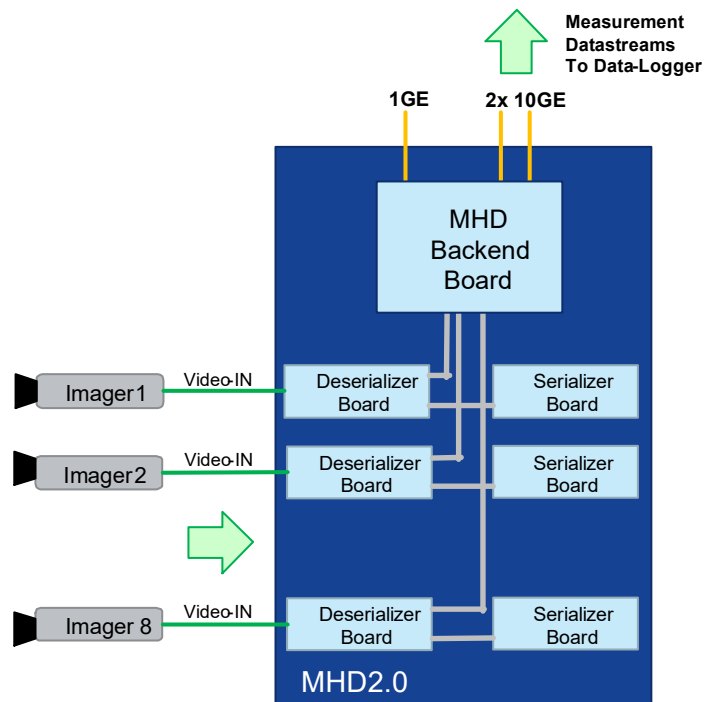


Fig. 2-6 Measurement Mode without ADCU

### 2.2.2 Debug

The MHD2.0 can be used to debug the video interface to the camera or debugging of the ADCU itself.



### 2.2.3 Replay

During replay the MHD2.0 device acts only as a data source. Pre-recorded data can be transferred from the replay computer to the MHD2.0 for regeneration and transmission to the ADCU:

- video data streams can be transmitted on up to 8 video output ports
- databus communication can be transmitted on the LVDS port e.g. SPI

The replay mode is supported by MHD2.0"-8R" devices.

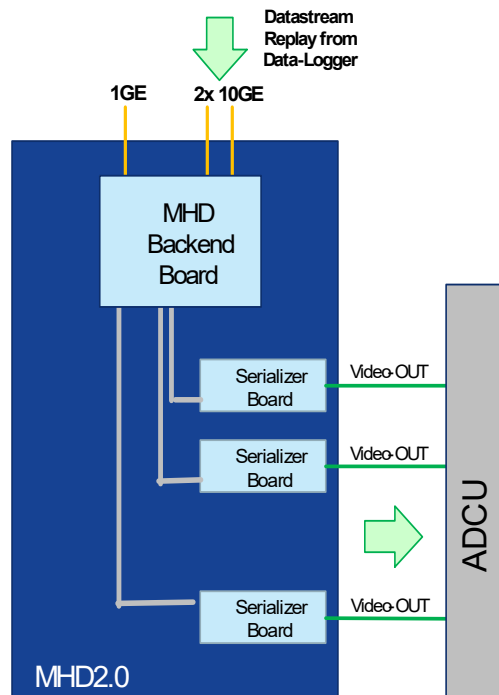


Fig. 2-7 Replay Mode

## 2.3 Features

- Video recording e.g. in MF4 format
- Lossless compression
- Data conversion from video raw data e.g. GMSL, FPD to GigE-vision and vice versa
- Different application scenarios
  - Measurement
  - Debugging
  - Replay
- Connections
  - 8x video input (MHD2.0 Measurement only)
  - 8x video output
  - 1x 1Gbit/s Ethernet
  - 2x 10Gbit/s Ethernet
  - SYNC to synchronize multiple MHD2.0
  - LVDS interface
  - Cascading interface

## 2.4 Cascading

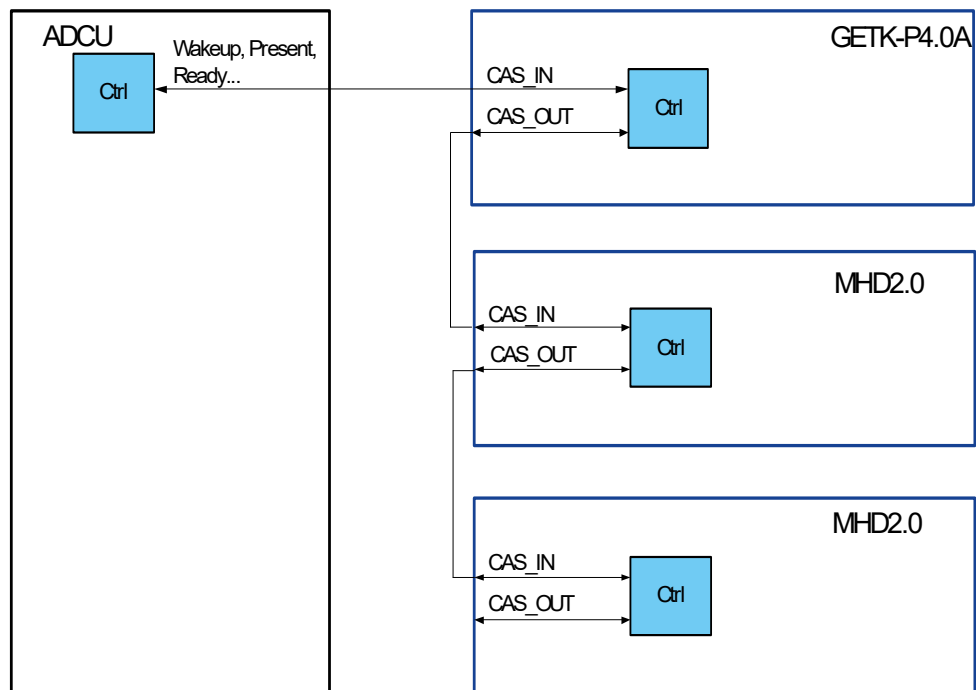
Multiple MHD2.0 or GETK-P4.0 devices can be combined into different scenarios together with the ADCU for measurement or replay of Video or PCIe data streams.

The cascading interface delivers basic information to the ADCU on the status of all connected devices supporting a handshake during startup and initialization.

General signals:

- Wakeup
- Present
- Ready
- Replay mode

Example scenario of multiple devices connected via the cascading interface for handshake with the ADCU.

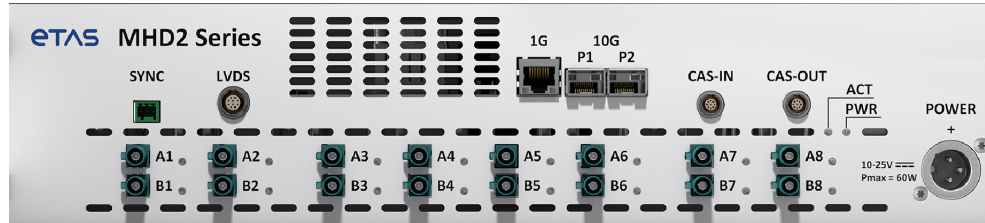


**Fig. 2-8** Cascading of MHD2.0 and compatible devices

## 3 Hardware

### 3.1 Interfaces

#### 3.1.1 MHD2.0 Measurement



**Fig. 3-1** Front panel of the MHD2.0 Measurement

Interface	Connector	Description
A1 - A8	8x Fakra	Video data input from camera with PoC supply (power-over-coax)
B1 - B8	8x Fakra	Video data output to ADCU
POWER	XLR	Power supply
1G	RJ45	Configuration and error correction via 1 Gbit Ethernet
10G	2x SFP+	Video data transfer between MHD2.0 and computer via 10 Gbit Ethernet
SYNC	Phoenix Contact MC 0,5/3	CAN-based synchronization of several MHD2.0
LVDS	LEMO 1B 10pin (H-key)	Databus communication, e.g. SPI
CAS-IN	Control signals LEMO 0B 9pin (A-key)	First MHD2.0 to ADCU Cascaded MHD2.0 to the previous MHD2.0
CAS-OUT	Control signals LEMO 0B 9pin (G-key)	To a cascaded MHD2.0

#### A1 - A8 Video inputs

The MHD2.0 Measurement has 8 inputs for the video sources.

- MHD2.0A-8M for Maxim
  - A1 - A8: GMSL2
- MHD2.0B-8M for Texas Instruments
  - A1 - A2: FPD-Link IV
  - A3 - A8: FPD-Link III

#### B1 - B8 Video outputs

The MHD2.0 has 8 video outputs for video data to an ADCU.

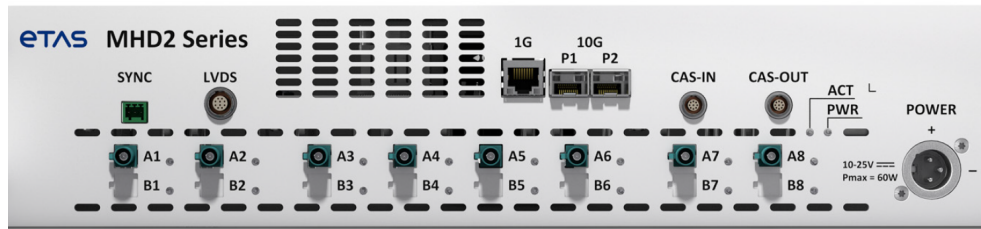
- MHD2.0A-8M for Maxim
  - B1 - B8: GMSL2
- MHD2.0B-8M and MHD2.0B-8R for Texas Instruments
  - B1 - B2: FPD-Link IV

- B3 - B8: FPD-Link III  
Transfer rate 6 Gbit/s or 3 Gbit/s.

**i NOTE**

For input and output: The right cameras must be connected to the corresponding inputs.

### 3.1.2 MHD2.0 Replay



**Fig. 3-2** Front panel of the MHD2.0 Replay

Interface	Connector	Description
A1 - A8	8x Fakra	Video data output to ADCU
POWER	XLR	Power supply
1G	RJ45	Configuration and error correction via 1 Gbit Ethernet
10G	2x SFP+	Video data transfer between MHD2.0 and computer via 10 Gbit Ethernet
SYNC	Phoenix Contact MC 0,5/3	CAN-based synchronization of several MHD2.0
LVDS	LEMO 1B 10pin (H-key)	Databus communication, e.g. SPI
CAS-IN	Control signals LEMO 0B 9pin (A-key)	First MHD2.0 to ADCU Cascaded MHD2.0 to the previous MHD2.0
CAS-OUT	Control signals LEMO 0B 9pin (G-key)	To a cascaded MHD2.0

#### A1 - A8 Video outputs

The MHD2.0 has 8 outputs for video data to an ADCU.

- MHD2.0A-8M for Maxim
  - A1 - A8: GMSL2
- MHD2.0B-8M and MHD2.0B-8R for Texas Instruments
  - A1 - A2: FPD-Link IV
  - A3 - A8: FPD-Link III  
Transfer rate 6 Gbit/s or 3 Gbit/s

### 3.1.3 POWER

The 3-pin XLR socket is used to power the MHD2.0. A suitable laboratory power supply or vehicle battery is required for the power supply. The appropriate cable can be found in chapter "CBP510-2 Power Supply Cable" on page 39.

### 3.1.4 1G

The MHD2.0 is configured using the 1G interface. This interface can be used to load configuration files and perform firmware updates. The Transfer rate is 1Gbit/s.

### 3.1.5 10G

With the two 10G interfaces, data with 10 Gbit/s transfer rate can be exchanged between the MHD2.0 and a measurement computer.

### 3.1.6 SYNC

If several MHD2.0s are used in a measurement setup for recording and forwarding video data, they can be synchronized using the SYNC interface.

### 3.1.7 LVDS

This can be used as a databus communication, e.g. SPI.

### 3.1.8 CAS-IN Interface


The CAS-IN interface contains control signals like Wakeup, Present, and Ready between the ADCU and the MHD2.0

### 3.1.9 CAS-OUT Interface


The CAS-OUT interface connects control signals like Wakeup, Present, and Ready to the next connected MHD2.0.

### 3.2 LEDs

#### PWR

LED-Code	Display	State
ON OFF _____ t	Off	No power supply
ON  OFF _____ t	Active (green)	Product is supplied with power

#### ACT

LED-Code	Display	State
ON OFF _____ t	Off	Checking whether modules matching the firmware are plugged in.
ON  OFF _____ t	Active (green)	System started

#### A1 - A8 / B1 - B8

The function depends on the software version and the device configuration. A detailed description can be found in the release notes.

### 3.3 Control Signals Functional Description

The control signals are present at the connectors CAS-IN and CAS-OUT.

They contain control signals like Wakeup, Present, and Ready.

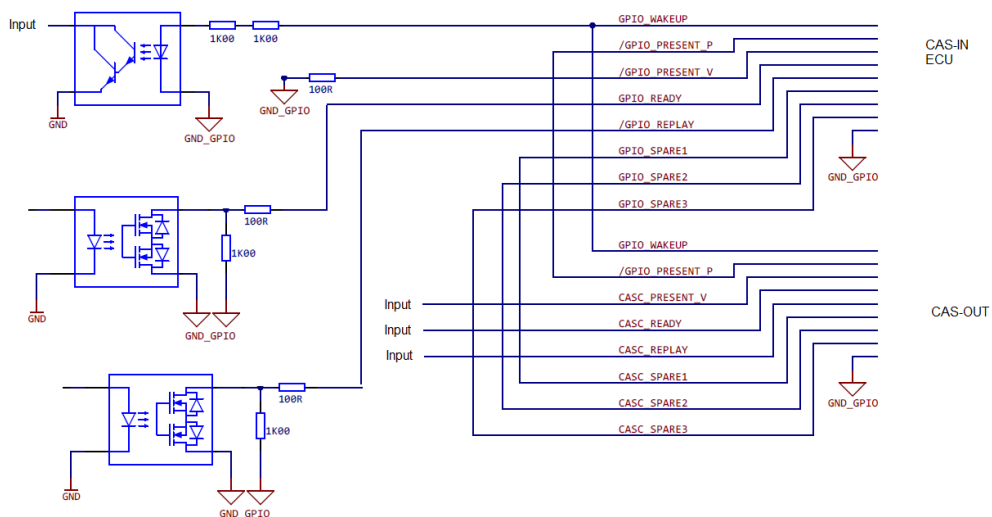
All signals are according to open drain standard. The control signals are optically isolated to prevent ground loops. Maximum voltage level: 15V

The signals from the ADCU must be connected at the CAS-IN.

When an additional MHD2.0 or a compatible device is added, the control signals are connected at the CAS-OUT to this device.

Signal	Direction	Functionality
Wakeup	From ADCU to MHD2.0	Wakeup MHD2.0 MHD2.0 changes from sleep (power save) state to operational state
/Present_V	From MHD2.0 to ADCU	MHD2.0 is attached ADCU may change configuration or behavior
/Present_P		Signal is not used.
Ready	From MHD2.0 to ADCU	MHD2.0 indicates the ADCU that it is ready for operation ADCU may wait for MHD2.0
/Replay_V (Video Replay or (HIL mode)	From MHD2.0 to ADCU	Video data is provided by MHD2.0 (replay), not by cameras ADCU may change configuration or behavior
ADCU GND	From ADCU to MHD2.0 or GETK-P4.0A	Reference GND for CAS-IN/Out signals

#### Internal Wiring between CAS-IN and CAS-OUT



**Fig. 3-3** Control signals CAS-IN and CAS-OUT

### 3.3.1 Wakeup (GPIO\_WAKEUP)

The Wakeup signal from the ADCU is an input signal for the MHD2.0. After the MHD2.0 detects the high signal, the MHD2.0 changes to the operation state.

This signal is looped through all cascaded MHD2.0 devices.

### 3.3.2 /Present\_V (/GPIO\_PRESENT\_V)

The /Present\_P signal at the connector CAS-IN is connected over a pull-down resistor to ADCU GND. With the connection to the ADCU the pull-up signal from the ADCU is pulled down.

The /Present\_P signal at CAS-OUT from a cascaded MHD2.0 is connected as an input.

### 3.3.3 Ready (GPIO\_READY)

A high Ready signal at CAS-IN signals to the ADCU, that the MHD2.0 is ready and the measurement can be started.

If an additional MHD2.0 is connected at CAS-OUT, then the Ready signal is only active, if the connected MHD2.0 has as well an activated Ready signal.

### 3.3.4 /Replay (/GPIO\_REPLAY)

A low signal at CAS-IN signals to the ADCU, that the MHD2.0 is in the replay mode. The video data is played back from the MHD2.0 and not from the video cameras.

The ADCU may change the configuration or behavior.



## 4 Commissioning

### 4.1 Installation

#### ***NOTICE***

##### Damage to the electronics due to potential equalization

The cables' shield may be connected to the housing, the ground or the ground for the product's power supply. If there are different ground potentials in the test setup, equalizing currents can flow between the products via the cables' shield. Take account of different electric potentials in your test setup and take appropriate measures to prevent equalizing currents.

The MHD2.0 housing is designed for mounting into a 19" rack. 2 height units (HU) are required for installation.

1. Slide the product into the DIN rail of the 19" rack.
2. Use 4 screws to secure the product to the intended fasteners.
3. Ensure sufficient air circulation for efficient heat exchange.
  - i. Keep an area of at least 5 cm clear to the rear and at least 9.5 cm to the front.
  - ii. Do not cover the ventilation slots.
  - iii. Do not operate the product in closed containers.



#### **WARNING**

##### Risk of injury due to inadequate fastening

Secure the product so that it does not move uncontrollably.

Only use carrier systems and fastening materials that can accommodate the static and dynamic forces of the product and are suitable for the ambient conditions.



#### **WARNING**

##### Risk to life from electric shock

If an unsuitable power supply is used, this may generate a hazardous electrical voltage.

- Use a power supply that is permitted for the product.
- Do not connect the product to power outlets.
- To prevent inadvertent connection to power outlets, use power cords with safety banana plugs in areas with power outlets.

**NOTICE**

**Damage to the electronics**

Incorrectly connected cables and devices may damage the product's electronics.

Connect only the appropriate cables and devices to the inputs and outputs.

## 4.2 System Requirements

ADCU and cameras (MHD2.0 Measurement only) require an interface that is compatible with following specs:

### MHD2.0A-8M:

A1/B1 - A8/B8: Maxim GMSL2

### MHD2.0B-8M:

A1/B1 - A2/B2: TI-FPD-Link IV

A3/B3 - A8/B8: TI-FPD-Link III

### MHD2.0B-8R:

A1 - A2: TI-FPD-Link IV

A3- A8: TI-FPD-Link III

## 4.3 Configuration and Firmware Update

### 4.3.1 Configuration

The configuration of the MHD2.0 must be adapted to the application scenario and the measurement setup. For a complete configuration, a corresponding configuration file and a table of the connected cameras are required to match the firmware.

All components in "Block diagram MHD2.0 Measurement internal functions" on page 13 and "Block diagram MHD2.0 Replay internal functions" on page 14, which are connected to the same video channel, such as MHD2.0 (Deserializer, Serializer) as well as the external devices (Imager, ADCU), are establishing a virtual I<sup>2</sup>C-bus. For a reliable communication and full functionality of the system, the bus addresses of all devices of the I<sup>2</sup>C-network have to be aligned and configured properly.

### 4.3.2 Firmware Update



#### NOTE

If you require firmware updates or customized configuration files, please contact ETAS.

#### Requirements

- Connection to the Internet to download additional packages for the MHD\_Configurator
- Firmware download software: MHD\_Configurator
- Firmware for the MHD: \*.swu
- Admin rights for configuring the network card under Windows
- Ethernet cable for the 1GE connection

Following procedure is described for Windows, should be similar for Linux.

### 4.3.3 IP Address Configuration

If no other IP-address is mentioned on the sticker, then the fixed IP-address for the 1GE-port for the MHD2.0 Measurement starting with SW version 1.21 is always:

- 192.168.40.14 .

This IP-address is fix. It can be used as a fall-back, if the customer IP-address is unknown.

The default customer IP-address for the 1GE-port for delivery is:

- 192.169.1.20

This address can be changed. Bot IP-addresses are valid at the same time.

### 4.3.4 Configuring network adapter of Host-PC

1. Connect to the 1GE-port
2. Use admin rights for the next steps
3. In Windows search, type > **network**
4. Select **Check network status**
5. Select **Change adapter options**
6. Select used **network card**
7. Select **Internet Protocol Version TCP/(IPv4)**
8. Select **Properties**

9. Set **IP address** and **Subnet mask** see example

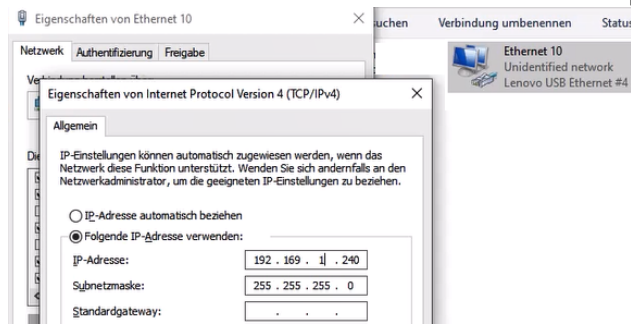


Fig. 4-1 Networksetting

#### 4.4 Using the MHD\_Configurator

After extracting the MHD\_Configurator

- doubleclick on
  - ..\MHD\_Configurator\_vxy\install\_gui\_requirements.bat

Some additional packages are downloaded from the internet.

- Doubleclick on
  - ..\MHD\_Configurator\_GUI.exe.

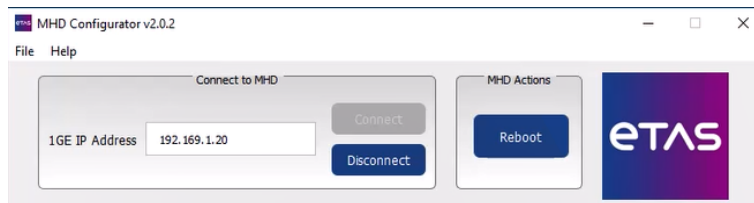


Fig. 4-2 MHD\_Configurator

- Click connect.

If successful, the installed firmware is displayed in tab software.

Display of the different Tabs of the MHD\_Configurator.

Software

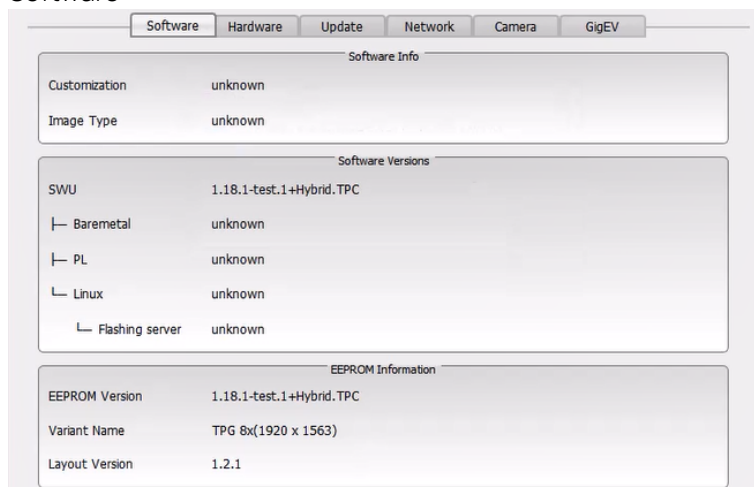
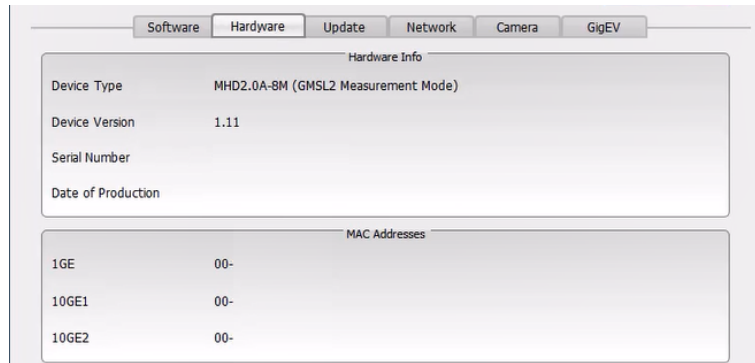


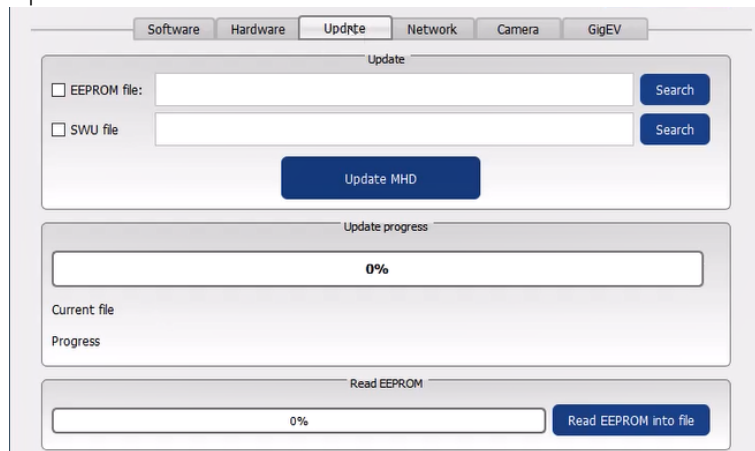
Fig. 4-3 Software

### Hardware



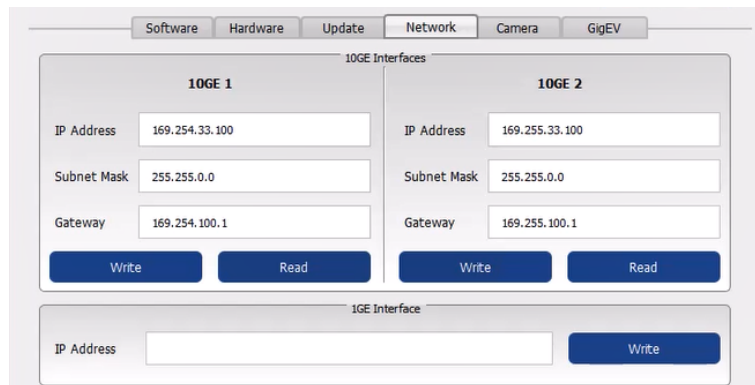
**Fig. 4-4** Hardware

### Update



**Fig. 4-5** Update

### Network



**Fig. 4-6** Network

Camera

Camera Configuration Source								
Slot	1	2	3	4	5	6	7	8
MHD	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
ECU	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Power-over-Coax (PoC) control								
Slot	1	2	3	4	5	6	7	8
Enabled	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Fig. 4-7 Camera

GigEV

Pixelformat	
<input checked="" type="radio"/> RCCG	<input type="radio"/> Mono16 <input type="radio"/> Other (Hex) <input type="text"/>

PTP Timestamps	
<input type="radio"/> Enabled	<input checked="" type="radio"/> Disabled







  

Compression								
Slot	1	2	3	4	5	6	7	8
Enabled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fig. 4-8 GigEV

## 5 Technical Data

### 5.1 Identification on the Product

Symbol	Description
	Always read the User Guide before commissioning the product.
SN: 1234567	Serial number (seven digits)
F 00K 123 456	Part number of the product (see "Order Information" on page 42)
Variant Label	Variant of the MHD2.0: MHD2.0A-8M MHD2.0B-8M MHD2.0B-8R
	Symbol for DC voltage
10 - 25 V DC	Operating voltage
60 W	Max. power consumption
	Marking for CE conformity (see "CE Marking" on page 32)
	UKCA conformity symbol (Great Britain), see "UKCA Declaration of Conformity (Great Britain)" on page 32
	China RoHS symbol, see chapter "China" on page 32
	Identification for WEEE, (see "Product Return and Recycling" on page 31)

### 5.2 Product Return and Recycling

The European Union (EU) released the Directive for Waste Electrical and Electronic Equipment - WEEE to ensure the setup of systems for collecting, treating and recycling electronic waste in all countries of the EU.

This ensures that the devices are recycled in a resource-friendly way that does not represent any risk to personal health and the environment.



**Fig. 5-1** WEEE-Symbol

The WEEE symbol (see "WEEE-Symbol" on page 31) on the product or its packaging identifies that the product may not be disposed of together with regular trash.).

The user is obligated to separately collect old devices and provide them to the WEEE return system for recycling.

The WEEE Directive applies to all ETAS devices, but not to external cables or batteries.

Additional information about the recycling program of ETAS GmbH is available from the ETAS sales and service locations (see "Contact Information" on page 43).

## 5.3 Declaration of Conformity

### 5.3.1 CE Marking

With the CE mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable directives of the European Union.

The CE Declaration of Conformity for the product is available upon request.

### 5.3.2 UKCA Declaration of Conformity (Great Britain)

With the UKCA mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable standards and directives of Great Britain. The UKCA declaration of conformity for the product is available on request.

## 5.4 RoHS Conformity

### 5.4.1 European Union

The EU Directive 2011/65/EU limits the use of certain dangerous materials for electrical and electronic devices (RoHS conformity).

This product does not contain any of the restricted substances specified in the EU Directive 2011/65/EU or exceeds the maximum concentrations stipulated therein. For individual electronic components used in our products, there are currently no equivalent alternative substances, which is why we make use of the exception 7A, 7C-I, and 6C (for accessory cables) in Annex III of this Directive.

ETAS confirms that the product corresponds to this directive which is applicable in the European Union.

### 5.4.2 China

ETAS confirms that the product meets the product-specific applicable guidelines of the China RoHS (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) applicable in China with the China RoHS marking affixed to the product or its packaging.

## 5.5 Declarable Substances

### European Union

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with substances that are subject to declaration in accordance with the REACH regulation (EU) no.1907/2006. Detailed information is located in the ETAS download center in the customer information „REACH Declaration“ ([www.etas.com/Reach](http://www.etas.com/Reach)). This information is continuously being updated.



### 5.6 Open Source Software

The product uses open source software (OSS). This software is installed in the product at the time of delivery and does not have to be installed or updated by the user. Reference must be made to the use of the software in order to fulfill OSS licensing terms. Additional information is available in the document "OSS AttributionsList" on the ETAS [website www.etas.com](http://www.etas.com).

### 5.7 Ambient conditions

Operating temperature range	-20 °C to +50 °C -4 °F to +122 °F
Storage temperature range (without packaging)	-20 °C to +50 °C -4 °F to +122 °F
Max. relative humidity (non-condensing)	95%
Max. altitude	4000 m 13100 ft
Degree of contamination (IEC 60664-1, IEC 61010-1)	2
Protection rating (when closed)	IP00

### 5.8 Mechanical Data

The MHD2.0 fits into a 19" rack and needs 2 U.

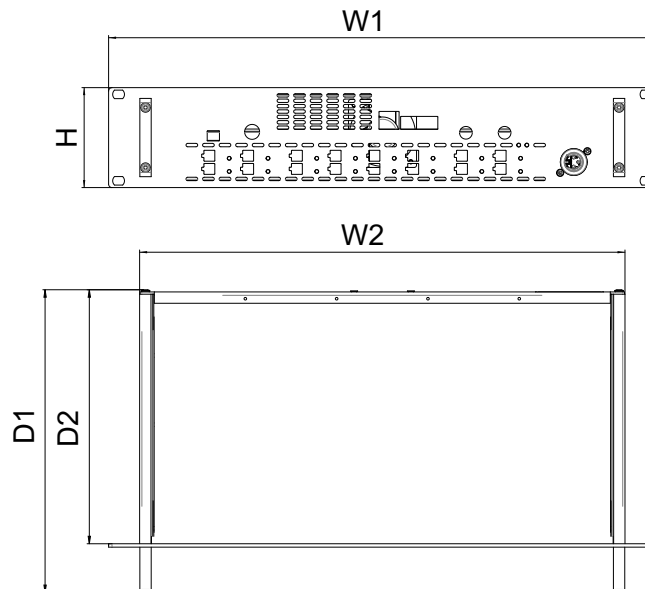


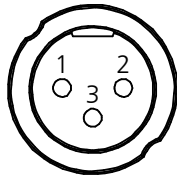
Fig. 5-2 Dimensions

Dimensions (H x W1 x D1)	88.9 x 483 x 267 mm / 3.5 x 19 x 10.51 in
(H x W2 x D2)	88.9 x 428 x 224 mm / 3.5 x 16.85 x 8.81 in
Weight	3.00 kg / 6.61 lb

### 5.9 Electrical Data

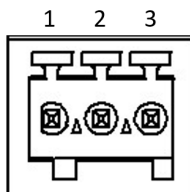
Operating voltage range	10 to 25 V DC ( $\pm 10\%$ )
Max. power consumption (at 20 V DC)	60 W
Overvoltage category (mains supply, IEC 60664-1)	II
Supply for video cameras (port A1-A8)	11 V DC ( $\pm 10\%$ ) Typical < 100 mA max. 300 mA

### 5.10 Power Connector



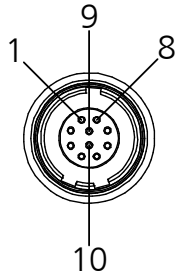
Pin	Signal	Function
1	-	Reserved
2	UBatt	Supply voltage
3	GND	Ground

### 5.11 SYNC Connector



Pin	Signal	Function
1	CAN_L	CAN Low
2	GND	Ground
3	CAN_H	CAN High

## 5.12 LVDS Connector



**Fig. 5-3** LVDS Interface Connector Lemo size 1B 10 pins with H-key

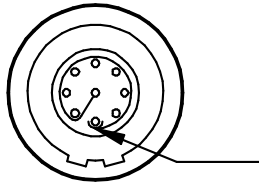
Pin	Signal	Function
1	Clk_RX+	Receive clock, positive polarity
2	Data_TX-	Transmit data, negative polarity
3	Data_TX+	Transmit data, positive polarity
4	Clk_TX-	Transmit clock, negative polarity
5	Clk_TX+	Transmit clock, positive polarity
6	Data_RX-	Receive data, negative polarity
7	Data_RX+	Receive data, positive polarity
8	Clk_RX-	Receive clock, negative polarity
9	n.c.	not connected
10	n.c.	not connected

### 5.13 CAS-IN Connector

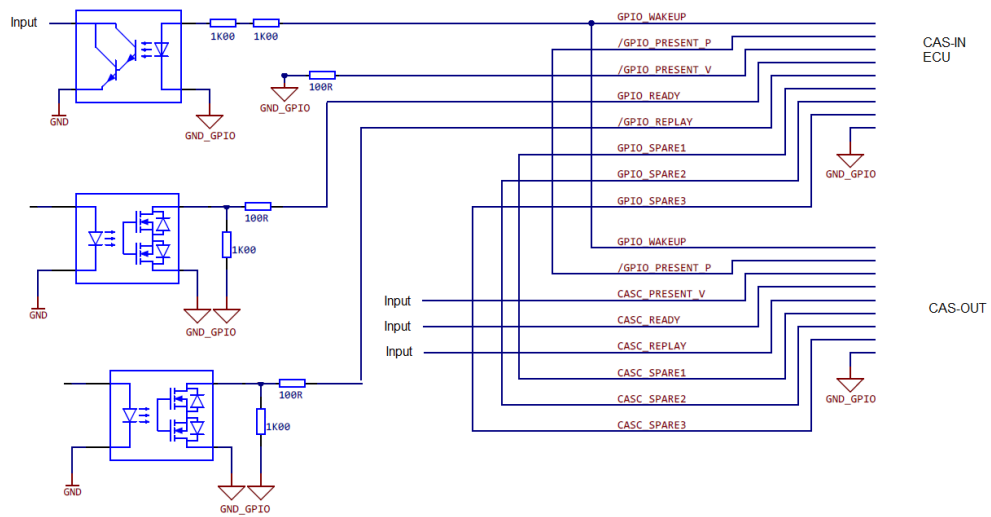
#### 5.13.1 CAS-IN Connector Characteristics

A female Lemo 0B 9 pins with "A" key is used. All signals with maximum voltage level of 15V.

Pin 1 is marked with an arrow.



**Fig. 5-4** CAS-IN Connector Lemo size 0B 9 pins with A-key  
Internal wiring between CAS-IN and CAS-OUT.



**Fig. 5-5** CAS-IN/Out internal connection

### 5.13.2 CAS-IN Connector Pinning

Signals with the symbol "/" are low active.

Referenced labels from Fig. 5-5 on page 36 are in brackets "()".

Pin	Label	Function	Comment
1	Wakeup (GPIO_WAKEUP)	input	Wakeup from the ADCU looped through a previous compatible measurement device (MHD2.0 or a GETK-P4.0A)
2	/Present_P (/GPIO_PRESENT_P)		looped through
3	/Present_V (/GPIO_PRESENT_V)	output	MHD2.0 is connected
4	Ready (GPIO_READY)	output	MHD2.0 is ready
5	/Replay_V (GPIO_REPLAY)	output	MHD2.0 is operating as a video data source (replay mode)
6	Reserved		
7	Reserved		
8	Reserved		
9	Reference ADCU GND (GND_GPIO)		ADCU ground

Typical voltage levels

Used voltage [V]	Low voltage [V]	Current [mA]
12	<1.1	11
5	<0.45	4.5
3.3	<0.3	3
2.5	<0.28	2.3
1.8	<0.16	1.6

## 5.14 CAS-OUT Connector

### 5.14.1 CAS-OUT Connector Characteristics

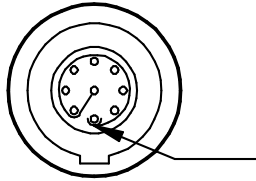
A female Lemo 0B 9 pins with "G" key is used.

All signals according to open drain standard and are galvanically isolated. Maximum voltage level: 15V

This connector is used to connect to an additional MHD2.0 or a GETK-P4.0A for Wakeup, Ready and other signals.

Pin 1,2, 6,7,8,9 are connected with CAS-IN.

Pin 1 is marked with an arrow.



**Fig. 5-6** CAS-OUT Connector Lemo size 0B 9 pins with G-key

### 5.14.2 CAS-OUT Connector Pinning

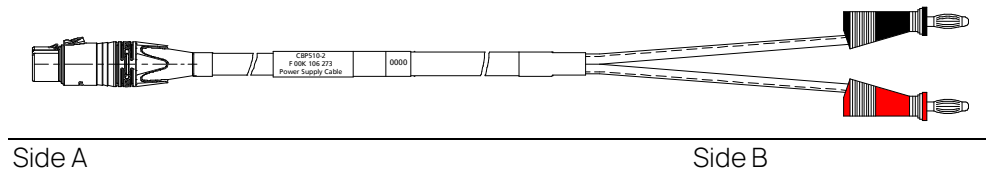
Signals with the symbol "/" are low active.

Referenced labels from Fig. 5-5 on page 36 are in brackets "()".

Pin	Label	Function	Comment
1	Wakeup (GPIO_WAKEUP)		Wakeup to the next compatible measurement device (GETK-P4.0A or MHD2.0) looped through
2	/Present_P (/GPIO_PRESENT_P)		/Present from next GETK-P4.0A looped through
3	/Present_V (/GPIO_PRESENT_V)	input	/Present_V read in from the next MHD2.0
4	Ready (GPIO_READY)	input	Ready read in from the next MHD2.0
5	/Replay_V (/GPIO_REPLAY)	input	Ready read in from the next MHD2.0
6	Reserved		
7	Reserved		
8	Reserved		
9	Reference ADCU GND (GND_GPIO)		ADCU GND

## 6 Cables and Accessories

### 6.1 CBP510-2 Power Supply Cable

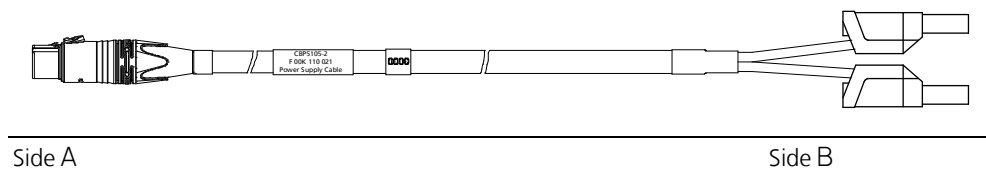


**Fig. 6-1** Cable CBP510-2

Side A		Side B	
Pin	Signal	Connector	Signal
1	n.c.		
2	UBATT	Red	UBATT
3	GND	Black	GND

Product	Short name	Length [m]	Part number
Power Supply Cable, Neutrik NC3FXX – Banana (3mc-2mc), 2 m	CBP510-2	2 m	F 00K 106 273

### 6.2 CBP5105-2 Power Supply Cable with Safety Banana Plugs



**Fig. 6-2** Cable CBP5105-2

Side A		Side B	
Pin	Signal	Connector	Signal
1	n.c.		
2	UBATT	Red	UBATT
3	GND	Black	GND

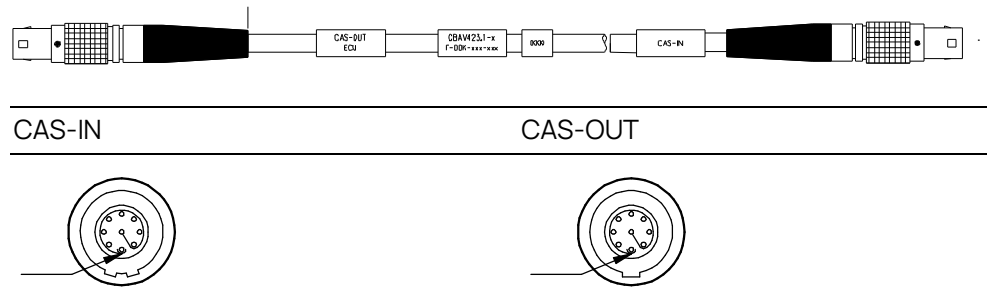
Product	Short name	Length [m]	Part number
Power Supply Cable, Neutrik NC3FXX – Safety Banana (3mc-2mc), 2 m	CBP5105-2	2	F 00K 110 021

### 6.3 CBAV423.1 CAS-IN/CAS-OUT GPIO Cascading Connection

This cable establishes handshake and control in cascading connections between ADCU and all measurement devices.

The cable has a 1:1 connection.

Pin 1 is marked with an arrow.

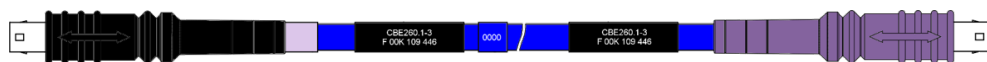


**Fig. 6-3** Cable CBAV423.1

Product	Short name	Length [m]	Order Number
GPIO Chain Connection, Lemo 0B FGG – Lemo 0B FGA (9mc- 9mc), 0m5.	CBAV423.1-0m5	0.5	F 00K 114 678
GPIO Chain Connection, Lemo 0B FGG – Lemo 0B FGA (9mc- 9mc), 3m.	CBAV423.1-3	3	F 00K 114 679
GPIO Chain Connection, Lemo 0B FGG – Lemo 0B FGA (9mc- 9mc), 5m.	CBAV423.1-5	5	F 00K 114 680
GPIO Chain Connection, Lemo 0B FGG – Lemo 0B FGA (9mc- 9mc), 10m	CBAV423.1-10	10	F 00K 114 681

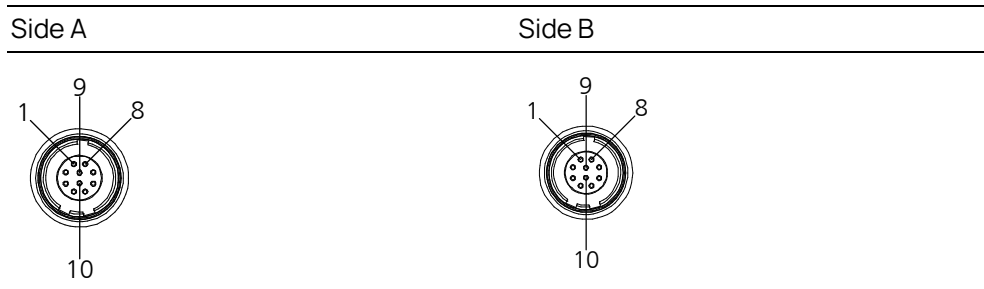
### 6.4 CBE260.1 LVDS Connection

For robust operation of the LVDS interconnection between MHD2.0 and ADCU, A snap ferrite (Wuerth Electronic, type 74271131) is recommended. The component shall be mounted next to cable connector on MHD2.0 side



**Fig. 6-4** Cable CBE260.1





Order name	Short name	Length [m]	Order number
Connection Cable, Lemo 1B FGM - Lemo 1B FGH (10fc-10mc), 3 m	CBE260.1-3	3	F 00K 109 446
Connection Cable, Lemo 1B FGM - Lemo 1B FGH (10fc-10mc), 8 m	CBE260.1-8	8	F 00K 109 447

## 7 Order Information

### 7.1 MHD2.0 Measurement

Long Text	Short Text	Part Number
Measurement Interface for capturing video raw signals, 8 channels, GMSL capturing Video raw signals, 8 channels <b>Package Contents</b> - MHD2.0A-8M - Power cable CBP510-2 - Safety Advice	MHD2.0A-8M	F 00K 114 130
Measurement Interface for capturing video raw signals, 8 channels, FPD-Link <b>Package Contents</b> - MHD2.0B-8M - Power cable CBP510-2 - Safety Advice	MHD2.0B-8M	F 00K 114 427

### 7.2 MHD2.0 Replay

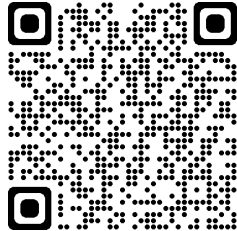
Long Text	Short Text	Part Number
Interface for replaying video raw signals, 8 channels, FPD-Link <b>Package Contents</b> - MHD2.0B-8R - Power cable CBP510-2 - Safety Advice	MHD2.0B-8R	F 00K 114 791

## 8 Contact Information

### Technical Support

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the ETAS website:

[www.etas.com/en/hotlines.php](http://www.etas.com/en/hotlines.php)



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## 9 Glossary

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### 9.1 Abbreviations and Terms

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Term	Explanation
1/10/40GE	Ethernet with 1/10/40MBit/s
ADCU	Autonomous Driving Control Unit
Cam	Camera
FPD	Field Programmable Device
FPGA	Field-programmable gate array: An integrated circuit designed to be configured by a customer or a designer after manufacturing
GMSL2	Gigabit Multimedia Serial Link
I2C	Two wire serial protocol that allows an I2C Master to exchange data with an I2C Slave
LVDS	Low-Voltage Differential Signaling
MF4	File format used from RALO
MIPI	Mobile Industry Processor Interface; in this case specification for the Camera Serial Interface
OSS	Open-Source-Software
PCIe	Peripheral Component Interconnect Express
PoC	Power-over-Coax (used as supply for cameras)
Power-over-Coax	PoC (used as supply for cameras)
PWR	Power
QSPI-Flash	Quad Serial Peripheral Interface, controller for read, write, erase, and verify functions.
SFP+	"Enhanced small form-factor pluggable Enhanced version of the SFP"
SPI	Serial Peripheral Interface
XLR	Connector name/manufacturer